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TABLE I.

C	I	II	III	IV	V	VI	VII
0–1	0						
1–2	+1						
1–3	+1	-2					
2–5	+1	-2	+3				
3–8	+1	-2	+3	-5			
5–13	+1	-2	+3	-5	+8		
8–21	+1	-2	+3	-5	+8	-13	
13–34	+1	-2	+3	-5	+8	-13	+21

velopment of the spirals in these cycles, we deduce the following two fundamental principles:

I. *Every cycle contains within itself in the form of spirals all the vertical ranks of the preceding cycles.*

II. *The consecutive orders of spirals mount one above another alternately to right and left till finally they reach the vertical ranks.*

14. As consequences of these two principles we may infer as follows:

a. The system begins with 0-1.

b. Every cycle discloses the preceding cycles of the system.

c. The number of spirals in the successive orders is the same as the denominators of the fractions which represent the system.

d. The spirals of the 1st, 3d, 5th, &c., orders have the same oblique direction to the right or to the left. The spirals of the 2d, 4th, 6th, &c., orders have the same oblique direction to the left or to the right, cross-wise of the spirals of the odd orders.

e. The common difference of the numbers in the series which represent any order of spirals is the same as the number of spirals in the order.—[To be continued.]

HELIOPSIS VS. HELIANTHUS.—Probably there are few botanists, especially of the less experienced ones, who are not deceived, at times, in regard to *Heliopsis lævis*, Pers. Even after studying *Heliopsis* and noting its peculiarities, it is still easy to mistake it. Its external appearance is so similar and yet its structure is so different from any *Helianthus* that we wonder how it was possible to be so completely deceived. Were this the case only with myself, it would be nothing remarkable, but I have heard other and more experienced workers speak of the same trouble. It certainly is very exasperating to take considerable pains to obtain neat specimens, lay them carefully in papers, and then find when you reach home that you have collected *Heliopsis* instead of some new *Helianthus*. The polymorphous nature of this species makes it the more difficult to recognize. In the typical form I have found the stem often glaucous and the leaves nearly smooth. The var. *scabra* has the leaves and often the stem scabrous. This form is the largest. Intermediate between these, there is a small form with smooth stem and scabrous leaves. Of course these all run into each other, so that we may expect anything from a glaucous to a scabrous stem, variously combined with smooth, rough or scabrous leaves. So much for appearance. When we look at the structure of the heads there is little similarity. Compare the two:

	Heliopsis.	*Helianthus.*
Rays . .	pistillate . .	neutral.
Receptacle . .	conical . .	flat or convex.
Chaff . .	linear-lanceolate . .	broad, embracing the achenia.
Pappus . .	none . .	two or four deciduous scales.

Keeping these points in mind there will be no trouble in recognizing *Heliopsis* at once. In dried specimens I find a peculiarity belonging to this species that does not seem to be possessed by any *Helianthus*. In the former the base of the rays is a deep orange color, shading off to light orange at the top. The back or outside of the ray florets is much lighter than the inside, becoming a straw yellow. These shades seems to be constant and exist in all my specimens, which, considering the universality of the species, are entirely too numerous. I do not find this shading to be present in any of the *Helianthi*. This presents an obvious means of distinguishing between the two and the presence of this coloring should at least lead us to suspect the identity of the species in question.—C. R. BARNES, *Madison, Ind.*

CROSS-FERTILIZATION IN LOBELIA SYPHILITICA.—In an article upon "Certain Contrivances for Cross-Fertilization in Flowers," published in the American Naturalist for January, Prof. J. E. Todd gives the following very interesting account of the arrangements for the cross-fertilization of *Lobelia syphilitica*, L.

The corolla is monopetalous and two lipped, the lower lip consisting of three petals and the upper of two. Between the latter is a slit extending to the base of the tube. The five stamens are free from the corolla and united, their anthers and upper parts of the filaments forming a tube; or it may be said, the anthers combining, form a common cell for the pollen, which opens by a pore at its apex. On the lower margin of the pore are many short, stiff hairs, which at first project across the pore closing it, but when the pollen is ripe they turn abruptly downwards and leave it open. There is only one pistil, which is armed near the end of the style with a collar of short stiff hairs, similar in size and character to those on the anthers just mentioned. The end of the style with its hairs forms the bottom of the pollen-cell before described. We have, therefore, the stigma shut up with the pollen in the same cell. "A capital arrangement for *self*-fertilization," one says. Nay, not too fast! The stigma is composed of two fleshy lobes, its receiving surface being on their inner surface And they are firmly closed together, so that the end of the pistil looks like a closed mouth with its lips firmly pressed together. With its bristly collar it reminds one of Jack-in-a-box, with an unusually "stiff upper lip."

This combined pistil and stamens is S-shaped, and when the flower opens, it springs through the slit of the corolla and stands with the tip of the pollen-cell just behind the upper lip of the corolla. Sometimes there is no trace of the stamens seen from the front; but if an insect tries to enter, the slit between the petals opens, the hairs of the anthers strike his back, and as he forces his way in, they produce a jarring of the pollen-cell which freely sprinkles the pollen upon him.

As the pollen escapes it is kept up to the pore by the pressure caused by the gradual lengthening of the style. The hairy collar acting like a swab, sweeps the cell clean. When all the pollen is gone, the style, continuing its growth, pushes the stigma through the pore and forward through between the upper petals. The end of the style then comes downward, the lips of the stigma open and roll back as though turning inside out. This exposes the whole surface of the stigma to be covered with pollen from the back of the first insect which comes from a flower discharging pollen. So the cross-fertilization is beautifully accomplished.

FUNGOID FRIENDS AND FOES—In the twenty-ninth annual report of the Regents of the University of the State of New York on the New York State Museum of Natural History, the report of the Botanist, Chas. H. Peck, contains the following interesting facts:

Nearly three hundred species of fungi that attack and inhabit living plants have been detected in the State (New York).

They affect almost as many species of flowering plants. In some cases several parasites attack the same host plant; in others, one parasite attacks two or more host plants indiscriminately. But, in many instances, a single parasite is peculiar to a single supporting plant, in which cases the latter may be taken by the student as a guide in his search for a description of the former. A Puccinia found on the leaves of the dwarf cornel, *Cornus Canadensis*, is almost certain to answer to the description of *Puccinia porphyrogenita*, and an Æcidium on the leaves of the barberry, *Berberis vulgaris*, will scarcely be any other than *Æcidium Berberidis*.

A fact of still greater moment is, that some of our cultivated plants are attacked by fungoid foes which, minute as they are, materially diminish their vigor, impair their useful products and, in some instances, even destroy their vitality. Raspberries are attacked by the American raspberry rust, *Uredo luminata;* pea vines, by the pea mildew, *Erysiphe Martii;* oats and wheat, by the grain smut, *Ustilago Carbo;* plum and cherry-trees, by the black-knot, *Sphæria morbosa;* and lettuce and onions by their respective molds, *Peronospora gangliformis* and *Peronospora Schleideniana.* Such fungi must be regarded as injurious to the interests of the husbandman, nor is the pecuniary loss which they occasion trivial or inconsiderable. The loss produced by the potato mold alone, *Peronospora infestans*, abundantly warrants all the effort and study that have been devoted to the investigation of the history of the fungus and to the discovery of some efficient means for preventing its attacks or overcoming their destructive consequences.

On the other hand those fungi that infest noxious weeds and hinder their dissemination and multiplication, must be regarded as the friends and allies of man. Thus the thistle rust, *Trichobasis suaveolens*, an early state of *Puccinia Compositarum*, sometimes attacks the Canada thistle with great virulence, and so impairs its vigor as to prevent the development of the seeds, thereby checking the propagation and spread of this pestilent plant. So, also, the troublesome bur-grass, *Cenchrus tribuloides*, is sometimes infested by a smut fungus, *Ustilago Syntherismæ*, which not only prevents the development of the seeds of the grass but also of the annoying bur-like involucres. It may yet be found practicable to keep down this grass by the artificial dissemination of the spores of its parasitic fungus in those light sandy soils where the grass usually abounds. It certainly is desirable that the life histories of these fungoid friends and foes should be better understood than they now are, and that the means of multiplying or diminishing their numbers according to their characters should be under the control of the farmer.

NEW SPECIES OF FUNGI, by Chas. H. Peck.—The eight species of fungi here described were collected by Mr. T. S. Brandegee and communicated to me by Mr. E. A. Rau. The quotations are from the notes of Mr. Brandegee.